A
DESCRIPTION
OF A
PULVERIZING MILL,

Lately invented for the USE of

APOTHECARIES,

TO

Supply the Place of the *Peſtle* and
Mortar.

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Ego pro te molam. TER.

LONDON:
Printed for J. BEW, No. 28, *Pater-Noſter-Row.*
MDCCLXXVII.

PREFACE.

THE great inconvenience and imperfection of the method commonly uſed to pulverize the hard bodies uſed in medicine, with the peſtle and mortar, have been long felt and acknowledged by the practiſers of phyſic; and theſe inconveniences are two-fold, the one ariſing from the great expence of time and labour neceſſary to render them in any degree fit for uſe, the other from the impoſſibility, by this method, of making compounds perfect; that is, when different ingredients are to be united, of ſecuring the juſt proportion of each of them required in the medicine: The firſt of theſe is too obvious to need any proof; but with reſpect to the latter, it may be neceſſary to enlarge a little. Some bodies, from the ſtructure of their parts, are more eaſy to pound and divide than others; and as the greater the interſtices of any matter are, the ſooner it will be ſeparated, and the lighter it will be; ſo, conſequently, thoſe particles which are more rare and light will, by the force of percuſſion in pounding, be ſooneſt put in motion; and being, perhaps, ſpringy, will riſe higheſt, and be loſt over the ſides of the mortar, before

before the matter leſs rare can be properly reduced; thus the compound will not be according to receipt. If we mean to try the natural power of a medicine, ſurely it is a matter of the firſt importance, that the medicine be not only genuine, but truly and accurately prepared. The phyſician preſcribes, but often-times his preſcription has not the deſired effect, owing ſometimes to the inequality of the preparation, and ſometimes to the ſophiſtication of drugs; and on the preſent plan of practice, this vexatious circumſtance is hardly to be avoided. The apothecaries ſhops, for the moſt part, are ſupplied with ready-prepared medicines from the druggiſts, who have at length reduced it to a trade; and he who can ſupply his cuſtomers at the cheapeſt rate, is the moſt likely to eſtabliſh an extenſive buſineſs: This introduces the practice of ſophiſtication, the greateſt evil attendant on the practice of phyſic, and by which the ingenious practitioner is ſet on a level with the moſt ignorant empiric. It is far from being the writer's intention in what he here advances, to give offence to any man or body of men, but only to ſhew the diſadvantage of applying medicines under the preſent mode of preparation.

ration. The mill, of which the following ſheets contain the deſcription, was invented with a view to ſupply theſe defects, and prevent theſe evils. A great expence of time and labour is hereby ſaved; the inconvenience attending the lighter particles of the drugs flying off in the uſe of the peſtle and mortar, is remedied by the denſity or cloſe adheſion of the parts which form the barrel of the mill; and every apothecary is enabled moſt eaſily and effectually to prepare his own medicines.

The author of this invention is well aware that it is ſtill capable of improve-

improvement, and only exhibits it as the outlines of a work that may hereafter be brought to perfection, by thoſe who are better ſkilled in mechanics than himſelf; but he humbly preſumes that, even in it's preſent ſtate, it will not be found inadequate to the purpoſe, or wholly unworthy the public notice: And the beſt excuſe that can be offered for it's appearing ſo early in the world, is a maxim he has long imbibed, that whatever may have a ſhadow of becoming a public benefit, cannot too ſoon be made known. He has been for ſome time happy in the uſe of it himſelf, and in having it ſo well approved by his very ingenious and learned friend Dr. *Glynn*, of *Cambridge.*

The following pages are intended to give mechanical inſtructions for the formation of this little machine, and to throw ſuch lights on the advantages attending it as may recommend it to a fair trial.

A
DESCRIPTION
OF THE
MACHINE.

IN *Fig.* I. the Reader is preſented with a view of the internal parts of the machine. The action of the wind drives round the ſails *A*, together with their axle *A B*, and the wheel *C* which is fixed to the axle. The wheel *C* having (ſuppoſe) fourteen teeth, drives the toothed wheel *D*, which being fixed to the axle *D E*, turns round the barrel *F*, which is alſo fixed to the ſame axle.

axle. This barrel contains the ingredients that are to be pulverized, and performs the work of a peſtle and mortar by a contrivance hereafter to be explained.

When any ingredients are to be put within the barrel, the wheel *D*, with it's axle and the barrel, are to be taken out of the mill. The barrel is then opened, by taking out it's moveable head *G H*, and the ingredients being placed within the barrel, together with ſome iron balls, are bruiſed and reduced to powder by the impulſe of the balls, which are inceſſantly toſſed about by the whirling of the barrel. To aſſiſt the action of theſe balls, four iron pegs (ſuch as are repreſented by *Fig.* II.) muſt be fixed within the barrel after the following manner:

Having drawn a circle within the barrel, about the middle, faſten therein the four iron pegs at the diſtance of a quarter of a circle from one another, ſo that their narrow ends (*Fig.* II.) may point towards each other from the oppoſite ſides of the barrel. Theſe pegs may be eaſily fixed by little ſcrew-nuts *n n* (*Fig.* I.) on the outſide of the barrel. The pegs being thus fixed, it is ſcarcely neceſſary to obſerve, that the balls rolling frequently againſt them will be driven with a conſiderable force againſt the ingredients within the barrel.

Preſuming then, that the Reader has now gained ſome general idea of the principal contrivance of this machine, and it's manner of operation, it only remains that I ſhould give a more minute deſcription of the particular parts, and after-

afterwards ſubjoin ſome few hints about the conſtruction and uſe of the whole.

When the wooden head *G H* of the barrel is taken out, the head *G H*, and the part *E K* (*Fig.* I.) of the axle are no longer faſtened together, but are ſeparate. The part *E K* is entirely of iron, and of ſuch a ſhape as is exhibited in *Fig.* III. in which the four arms are ſuppoſed to croſs one another at right angles. The four iron arms of *E K* being made to preſs againſt the head *G H* of the barrel, confine it in it's proper place, as may be conceived from *Fig.* I. This being underſtood, the method of cauſing the iron arms to preſs againſt the head of the barrel, ſo as to make (as it were) a part of it, and turn together with it, may be readily comprehended.

When

When the moveable head is thruſt a little way into the barrel (where it may reſt either againſt a ſhoulder cut within the ſides of the barrel, or a collar of ſtiff leather faſtened there for the purpoſe) the ſides of the barrel will ſtand up about half an inch above the head, in the ſame manner as in a common beer-barrel. Within theſe ſides let four notches be cut about a quarter of an inch deep, at the diſtance of a quarter of a circle from one another, for the reception of the four arms, which, by theſe means, will preſs flat againſt the head, and may be kept in that ſituation by the following contrivance.

Fig. IV. repreſents a thin plate of iron, (which I ſhall call an iron ſtrap) having a ſquare hole *q* at one end, and a round hole *r* at the other. The round hole *r* being put upon a hook (ſuppoſe) at one end of the barrel, as in *Fig.* I. may be eaſily bent according to the form of the barrel, and made to lie in the ſituation *r q*; ſo that the ſquare hole *q* may ſlip upon one of the ends of the four iron arms, and hold it tight. There muſt be four ſuch iron ſtraps, each laying hold of an iron arm, at the diſtance of a quarter of a circle from one another. The four iron arms muſt extend about half an inch beyond the notches in which they are placed, and in every arm a kind of notch *t* (*Fig.* III.) ſhould be made, from which to the extremity, the iron ſhould gradually ſlope; ſo that the ſquare hole *q* of the ſtrap being ſlipped over the ſlope into the notch, may there be detained after a manner not unlike to that of a latch within a catch upon a door: Indeed the hold of the iron ſtrap may be further increaſed by ſcrewing in the four

ſcrews

ſcrews *s* (*Fig.* III.) againſt the head of the barrel. Every ſcrew works through an inſide ſcrew in each of the iron arms, ſo that when it is turned, the iron arm connected with it, is forced to recede a little from the head of the barrel, whereby the ends of the four iron arms preſs upwards againſt the ſtraps hung on them with ſuch a degree of force as may be neceſſary. It would not be amiſs to faſten four ribs of wood to the head of the barrel, as in *Fig.* V. for they would at the ſame time receive the preſſure of the ſcrews *s* of *Fig.* III. and ſerve to ſtrengthen the head of the barrel. Each ſcrew *s* ſhould be faſtened by a ſtring paſſing through a hole in it's handle (repreſented *Fig.* III.) and winding round, be tied, that the motion of the barrel may not looſen the ſcrew from it's hold.

One thing may be further obſerved of the moveable head of the barrel, that it ſhould be lined on it's inner ſide with thick buck leather, whereby it may be made to fit the barrel ſo cloſely, as even to hold mercury if neceſſary.

When I deſcribed the manner of faſtening the four iron ſtraps on the barrel, I obſerved that the round holes *r* (*Fig.* I.) might be made to paſs upon a hook. Now four ſuch iron arms as are faſtened to the *moveable* head, may be ſcrewed upon the *oppoſite* and *fixed* end of the barrel, the extremities of which arms projecting a little beyond the ſides of the barrel, may be turned up, and anſwer the purpoſe of hooks to the ſtraps, as in *Fig.* VI. This contrivance will ſerve both to ſtrengthen the barrel, and to keep it ſteady in it's revolutions; for from the center of theſe iron arms, (which I ſuppoſe *faſtened* to the fixed head of the barrel by any number of ſcrews at pleaſure) a thick iron bar may proceed, as in *Fig.* VI. which may become an axle to the wheel *D*. Thus the ſecond axle in the mill (*Fig.* I.) and all it's appurtenances become one ſtrong and compact ſubſtance, not likely to be injured even in a high wind.

For the ſame purpoſes of ſtrengthening the work, and to prevent a wabbling motion of the firſt axle which turns together with the ſails, I have fixed a board (*Fig.* VIII.) without the mill, and faſtened it by ſcrews to the front plank at *z y* (*Fig.* I.) This board has a hole in the middle *o a*, through which the ſail-axle paſſes. Such a contrivance will keep the ſail-axle ſteady; for the parts of the board (*Fig.* VII.)

when

when ſhut, (as in *Fig*. VIII.) will cloſe upon the neck of the axle by means of the hole *o a*, the diameter of which being about four inches, nearly equals that of the neck. The ſupport of the mill may be made like that of any common windmill: As for inſtance, *L* is a ſtrong poſt (*Fig*. I.) whereon the whole machine turns, which may alſo have two ſhoulders proceeding from it, for the better ſupport of the weight to be ſuſtained; *M* is a floor through which the poſt paſſes, and *N* is a ſecond floor (ten inches above the former) which receives the end of the poſt, and confirms it's hold and ſupport of the mill. The mill may be turned upon the poſt by a board *X*, five feet long, as in *Fig*. *IX*. which will alſo ſerve as a vane to keep the mill in the wind. In that figure the mill is repreſented as boarded on all ſides, having a door *w* turning on two hinges, which is to be opened as often as there may be occaſion to take out the barrel and axle in the uſe of the mill.

As to the ſituation of the mill, any ſpot will ſerve that expoſes the ſails to the action of the wind. My own mill ſtands upon the top of an out-houſe, in the roof of which are two wooden doors, which being thrown open, and ſupported by chains, afford a convenient ſtage for a perſon to ſtand upon, who occaſionally attends to the working of the machine. But that the Reader may form a more juſt notion of the whole deſign, it may not be amiſs to add the materials and dimenſions of the particular parts of the machine.

The wood which the artiſt ſhould uſe in the conſtruction of this machine ought to be light and tough, ſuch as abele or willow. If the two ends of the mill are conſtructed of plank two inches, or two inches and a half thick, the ſide boards may be nailed to them.

Let the length of the body be twenty-ſix inches, it's breadth eleven inches, and the height twenty-eight inches, excluſive of the roof.

Let each ſail be three feet two inches in length from the axle to it's extremity, and let the width of each be ſixteen inches.

The ſail-axle ſhould be made of good aſh or oak, about four inches and a half ſquare in that part where the mortices are made to admit the backs or pieces to which the ſails are faſtened. It ſhould alſo be turned with a grove an inch wide,

wide, and a quarter of an inch deep about the neck. In the ſame axle, if you faſten an iron peg, and afterwards ſuſpend a ſort of iron ſtrap, (like one of thoſe mentioned above) from the roof by a ſtaple, the hole in the ſtrap may be made to lay hold of the iron peg occaſionally, and eaſily ſtop the working of the mill. And here I muſt obſerve, that it is neceſſary to put a collar of iron round the axle-tree in the part where the peg is fixed, for otherwiſe a high wind might twiſt or even break the peg from it's hold.

The board, *Fig.* VII. or VIII. that ſerves to keep the axle-tree ſteady, muſt be an inch thick; and the two parts of this board may be eaſily kept together by wooden bolts and ſcrews.

All the wheels ſhould be made of knotty twiſted elm; but if no wood of this kind can be procured, let the round wheel *firſt* be formed, and let the cogs be *afterwards* fixed in them. The former, however, is the eaſieſt and cheapeſt method.

The wheel *C* (*Fig.* I.) on the ſail-axle, ſhould be about five inches and a half in diameter, excluſive of the teeth, the number of which may be determined by the judgment of the artiſt. This wheel (before the cutting of the teeth) muſt be turned a little beviling, by way of allowance for the inclined poſition of the ſail-axle, as in *Fig.* I. by which means the teeth of this wheel will be made to fit exactly to the teeth of the wheel *D* underneath. The diameter of each of the wheels *C* and *D*, including the teeth, ought to be ſeven or ſeven inches and a half. The caſk or barrel may contain about two gallons. Make it of dry rift oak, about half an inch thick, and bind it (like a common beer-barrel) with four iron hoops. Each hoop may be further ſecured by fixing a ſmall ſcrew on that ſide of it which is towards the narrow end of the barrel.

The iron ſpindles, (the one fixed and the other moveable) with their four arms at either end of the barrel, have been already deſcribed. I have only to add, that a knob *E*, at the end of the moveable ſpindle (*Fig*. I.) will be found very convenient; becauſe if this knob be let into a cavity of the wood (or bone, or braſs) it turns upon, it will want no other ſecurity.

Six or eight iron balls may be procured from Woolwich of any ſize, but thoſe of ſix ounces will beſt be ſuited to a two gallon barrel. A barrel of this ſize will powder a pound and a half, or two pounds, at a time, of ipecacuanha, jallap, bark, and ſuch like; but a ſmaller quantity of light ingredients ſhould be put in at once, ſuch as flores chamæmeli, flores roſarium, &c. But before you powder ſuch a medicine as rad. jallapii, I adviſe that it ſhould be firſt cut with a cutting knife and block, whereby it may be the more eaſily and perfectly pulverized. All ſpherical or globular roots, muſt be cut before they are put into the mill; and the ginger muſt alſo be cut, when you would make ſpec. aromat. Cut alſo, and that very thinly, in the pulvè tragacanth. comp. the rad. altheæ, and glycyrhizæ.

It is no ſmall recommendation to this machine, that it not only prepares the medicines in a better manner, but in a much ſhorter time than any engine already in uſe. In general, it will perform it's work in twenty-four hours, with a good wind; though I have often ſuffered it to go for a whole week or longer; by which means it has reduced the contents of the barrel to a perfect alcohol. Æthiops mineralis in particular (*i. e.* argent. viv. flor. ſulphur. ana ℔ij.) it will pound in four days much better, and with leſs loſs than the ſame can be done with a peſtle and mortar in as many months.

But let uſe and experience recommend the excellence of the machine, and the ſimplicity of it's invention; for although it has been my principal deſign to conſult the advantage and convenience of

Apothecaries, I am not without hopes of it's being found uſeful hereafter in many other branches of buſineſs. Great improvements, no doubt, may be made by enlarging the ſcale, and by ſubſtituting a barrel of caſt iron for one of wood; by which means it's uſe hereafter may be admitted among perfumers, colourmen, and ſuch other artiſts as have occaſion to pulverize the commodities belonging to their reſpective trades.

FINIS.